In the Specification

1. Please insert the following new heading and paragraph immediately below the Title of the Invention:

Claim of Priority

This application claims the benefit of priority under 35 U.S.C. § 119(e) of U.S. Provisional Application Serial No. 60/519,105 filed on November 12, 2003.

2. Please replace the first paragraph in the "Background Information" section on page 1 with the following amended paragraph:

Quantum key distribution involves establishing a key between a sender ("Alice") and a receiver ("Bob") by using weak (e.g., 0.1 photon on average) optical signals transmitted over a "quantum channel." The security of the key distribution is based on the quantum mechanical ~~principal~~ principle that any measurement of a quantum system in unknown state will modify its state. As a consequence, an eavesdropper ("Eve") that attempts to intercept or otherwise measure the quantum signal will introduce errors into the transmitted signals, thereby revealing her presence.

3. Please replace the third paragraph in the "Background Information" section on page 1 with the following amended paragraph:

The above-mentioned publications each describe a so-called "one-way" QKD system wherein Alice randomly encodes the polarization or phase of single photons, and Bob randomly measures the polarization or phase of the photons. The one-way system described in the ~~Bennett 1992 paper~~ '410 patent is based on two optical fiber Mach-Zehnder interferometers. Respective parts of the interferometric system are accessible by Alice and Bob so that each can control the phase of the interferometer. The signals (pulses) sent from Alice to Bob are time-multiplexed and follow different paths. As a consequence, the interferometers need to be actively stabilized ~~to within a few tens of nanoseconds~~ during transmission to compensate for thermal drifts.

4. Please replace the fifth paragraph in the "Background Art" section on page 2 and carrying over to page 3 with the following amended paragraph:

When operating a commercial QKD system, multiple variables need to be aligned in time and then maintained aligned for optimal system performance. For example, in a commercial QKD system one or more single-photon detectors are gated with a gating pulse from a controller to synchronize the detection of optical pulses with expected pulse arrival times. However, once the system is set up, the timing drifts due to various systemic and environmental factors and the photon count can drop. This leads to a reduction in the transmission rate of the system, and also to an increase in the bit-error rate—i.e., to less than optimal system performance.

5. Please replace the first paragraph in the "Brief Description of the Drawings" section on page 3 with the following amended paragraph:

FIG. 1 is an example embodiment of a two-way QKD system; ~~and~~

6. Please replace the first paragraph in the "Brief Description of the Drawings" section on page 3 with the following amended paragraph:

FIG. 3 is an example plot of a single-photon detector gate scan for a QKD system such as shown in FIG. 1, wherein the Y-axis is the number of photon counts N in a regular time interval, and the X-axis is the timing of the single-photon detector gate associated with the timing (position) of the detector gate pulse.; ~~and~~

7. Please replace the second paragraph under the sub-heading "Alice" on page 4 with the following amended paragraph:

Alice also includes a controller 288 operatively (e.g., electrically) coupled to PM 266 and VOA 264. In an example embodiment, controller 288 includes a programmable computer capable of performing instructions (e.g., "software") stored on a computer-

readable medium 289. In an example embodiment, the instructions stored on the computer-readable medium 289 include methods according to the present invention as described below.

8. Please replace the second paragraph under the sub-heading "Alice" on top of page 5 with the following amended paragraph:

Controllers 248 and 288 are linked (e.g., electrically or optically) via link 290 to synchronize the operation of Alice and Bob. In particular, the operation of the phase modulators 220 and 266, and detector 216 are controlled and coordinated by controllers 248 and 288 relative to the launched optical pulse 204 using gating signals S2, ~~S3~~ S1 and ~~S1~~ S3, respectively, when exchanging a quantum key between Alice and Bob. Thus, in an example embodiment, controllers 248 and 288 can be considered as constituting a single controller for the QKD system.

9. Please add the following new paragraph as the last paragraph in the "Detailed Description of the Invention" section at the bottom of page 8 immediately prior to the claims section:

In the foregoing Detailed Description, various features are grouped together in various example embodiments for ease of understanding. The many features and advantages of the present invention are apparent from the detailed specification, and, thus, it is intended by the appended claims to cover all such features and advantages of the described apparatus that follow the true spirit and scope of the invention. Furthermore, since numerous modifications and changes will readily occur to those of skill in the art, it is not desired to limit the invention to the exact construction, operation and example embodiments described herein. Accordingly, other embodiments are within the scope of the appended claims.